NRC FORM 618 (8-2000) 10 CFR 71	U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9297	2	71-9297	USA/9297/AF-96	1 OF	6

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

a. ISSUED TO *(Name and Address)*

Westinghouse Electric Company
P.O. Drawer R
Columbia, SC 29250

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Westinghouse Electric Company application dated April 1, 2004, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model Nos.: Traveller STD and Traveller XL

(2) Description

The Traveller package is designed to transport non-irradiated uranium fuel assemblies or rods with enrichment up to 5.0 weight percent. The package is designed to carry one fuel assembly or one container for loose rods. The package consists of three components: 1) an outerpack, 2) a clamshell, and 3) a fuel assembly or rod container.

The outerpack is a structural component that serves as the primary impact and thermal protection for the fuel assembly or rod container. The outerpack has a long horizontal tubular design consisting of a top and bottom half. At each end of the package are thick limiters consisting of two sections of foam of different densities sandwiched between three layers of sheet metal. The impact limiters are integral parts of the outerpack and reduce damage to the contents during an end, or high-angle drop. The outerpack also provides for lifting, stacking, and tie down during transportation.

The clamshell is a horizontal structural component that serves to protect the contents during routine handling and in the event of an accident. The clamshell consists of an aluminum "v" extrusion, two aluminum door extrusions, and a small access door. Each extruded aluminum door is connected to the "v" extrusion with piano-type hinges (continuous hinges). These doors are held closed with a latching mechanism and quarter-turn bolts. Neutron absorber plates are installed in each leg of the "v" extrusion and in each of the doors. The "v" extrusion and the bottom plate are lined with a cork rubber pad to cushion and protect the contents during normal handling and transport conditions.

5.(a)(2) Description (Continued)

The Traveller package is designed to carry loose rods using either of two types of rod containers: a rod box or rod pipe. The rod box is an ASTM, Type 304 stainless steel container of rectangular cross section with stiffening ribs located approximately every 60 centimeters (cm) (23.6 inches (in.)) along its length. It is secured by fastening a removable top cover to the container body using socket head cap screws. The rod pipe consists of a 15.2 cm (6 in.) standard 304 stainless steel, Schedule 40 pipe, and standard 304 stainless steel closures at each end. The closure is a 0.635 cm (0.25 in.) thick cover secured with Type 304 stainless steel hardware to a flange fabricated from 0.635 cm (0.25 in.) thick plate.

There are two models of the Traveller packaging, the Traveller STD and the Traveller XL.

Traveller STD:

Package gross weight	2,041 kilograms (kg) (4,500 pounds (lbs))
Packaging gross weight	1,293 kg (2,850 lbs)
Contents gross weight	748 kg (1,650 lbs)
Outer dimensions	
Length	500 cm (197 in.)
Width	68.6 cm (27.1 in.)
Height	100 cm (39.3 in.)

Traveller XL:

Package gross weight	2,313 kg (5,100 lbs)
Packaging gross weight	1,419 kg (3,129 lbs)
Contents gross weight	894 kg (1,971 lbs)
Outer dimensions	
Length	574 cm (226.1 in.)
Width	68.6 cm (27.1 in.)
Height	100 cm (39.3 in.)

(3) Drawings

The packagings are fabricated and assembled in accordance with the following Westinghouse Electric Company's Drawing Nos.:

10004E58, Rev. 4 (Sheets 1-8)
10006E58, Rev. 5
10006E59, Rev. 1 (Sheets 1-2)

(b) Contents (Type and Form of Material)

(1) Fuel Assembly

(i) Unirradiated PWR uranium dioxide fuel assemblies with a maximum uranium-235 enrichment of 5.0 weight percent. The parameters of the fuel assemblies that are permitted are as follows:

5.(b)(1)(i) Fuel Assembly (Continued)

Parameters for 14 x 14 Fuel Assemblies

Fuel Assembly Description	14 x 14	14 x 14	14 x 14
Fuel Assembly Type	W-STD	W-OFA	CE-1/CE-2
No. of Fuel Rods per Assembly	179	179	176
No. of Non-Fuel Rods	17	17	20
Nominal Guide Tube Wall Thickness	0.043 cm (0.017 in.)	0.043 cm (0.017 in.)	0.097 cm (0.038 in.)
Nominal Guide Tube Outer Diameter	1.369 cm (0.539 in.)	1.336 cm (0.526 in.)	2.822 cm (1.111 in.)
Nominal Pellet Diameter	0.929 cm (0.366 in.)	0.875 cm (0.344 in.)	0.956/0.966 cm (0.376/0.381 in.)
Nominal Clad Outer Diameter	1.072 cm (0.422 in.)	1.016 cm (0.400 in.)	1.118 cm (0.440 in.)
Nominal Clad Thickness	0.062 cm (0.024 in.)	0.062 cm (0.024 in.)	0.071/0.066 cm (0.028/0.026 in.)
Clad Material	Zirconium alloy	Zirconium alloy	Zirconium alloy
Nominal Assembly Envelope	19.70 cm (7.76 in.)	19.70 cm (7.76 in.)	20.60 cm (8.11 in.)
Nominal Lattice Pitch	1.412 cm (0.556 in.)	1.412 cm (0.556 in.)	1.473 cm (0.580 in.)

Parameters for 15 x 15 Fuel Assemblies

Fuel Assembly Description	15 x 15	15 x 15
Fuel Assembly Type	STD/OFA	B&W
No. of Fuel Rods per Assembly	205	208
No. of Non-Fuel Rods	20	17
Nominal Guide Tube Wall Thickness	0.043/0.043 cm (0.017/0.017 in.)	0.043 cm (0.017 in.)
Nominal Guide Tube Outer Diameter	1.387/1.354 cm (0.546/0.533 in.)	1.354 cm (0.533 in.)
Nominal Pellet Diameter	0.929 cm (0.366 in.)	0.929 cm (0.366 in.)
Nominal Clad Outer Diameter	1.072 cm (0.422 in.)	1.072 cm (0.422 in.)
Nominal Clad Thickness	0.062 cm (0.024 in.)	0.062 cm (0.024 in.)
Clad Material	Zirconium alloy	Zirconium alloy
Nominal Assembly Envelope	21.39 cm (8.42 in.)	21.66 cm (8.53 in.)
Nominal Lattice Pitch	1.430 cm (0.563 in.)	1.443 cm (0.568 in.)

5.(b)(1)(i) Fuel Assembly (Continued)

Parameters for 16 x 16 Fuel Assemblies

Fuel Assembly Description	16 x 16	16 x 16	16 x 16	16 x 16
Fuel Assembly Type	W-STD	CE	NGF	ATOM
No. of Fuel Rods per Assembly	235	236	235	236
No. of Non-Fuel Rods	21	20	21	20
Nominal Guide Tube Wall Thickness	0.046 cm (0.018 in.)	0.102 cm (0.040 in.)	0.041 cm (0.016 in.)	0.057 cm (0.023 in.)
Nominal Guide Tube Outer Diameter	1.196 cm (0.471 in.)	2.489 cm (0.980 in.)	1.204 cm (0.474 in.)	1.354 cm (0.533 in.)
Nominal Pellet Diameter	0.819 cm (0.323 in.)	0.826 cm (0.325 in.)	0.784 cm (0.309 in.)	0.914 cm (0.360 in.)
Nominal Clad Outer Diameter	0.950 cm (0.374 in.)	0.970 cm (0.382 in.)	0.914 cm (0.360 in.)	1.075 cm (0.423 in.)
Nominal Clad Thickness	0.057 cm (0.023 in.)	0.064 cm (0.025 in.)	0.057 cm (0.023 in.)	0.072 cm (0.029 in.)
Clad Material	Zirconium alloy	Zirconium alloy	Zirconium alloy	Zirconium alloy
Nominal Assembly Envelope	19.72 cm (7.76 in.)	20.63 cm (8.12 in.)	19.72 cm (7.76 in.)	22.95 cm (9.03 in.)
Nominal Lattice Pitch	1.232 cm (0.485 in.)	1.285 cm (0.506 in.)	1.232 cm (0.485 in.)	1.430 cm (0.563 in.)

Parameters for 17 x 17 and 18 x 18 Fuel Assemblies

Fuel Assembly Description	17 x 17	17 x 17	18 x 18
Fuel Assembly Type	W-STD/XL	W-OFA	ATOM
No. of Fuel Rods per Assembly	264	264	300
No. of Non-Fuel Rods	25	25	24
Nominal Guide Tube Wall Thickness	0.041/0.051 cm (0.016 /0.020 in.)	0.041 cm (0.016 in.)	0.065 cm (0.026 in.)
Nominal Guide Tube Outer Diameter	1.204/1.224/1.24 cm (0.474/0.482/0.488 in.)	1.204 cm (0.474 in.)	1.240 cm (0.488 in.)
Nominal Pellet Diameter	0.819 cm (0.323 in.)	0.784 cm (0.309 in.)	0.805 cm (0.317 in.)
Nominal Clad Outer Diameter	0.950 cm (0.374 in.)	0.914 cm (0.360 in.)	0.950 cm (0.374 in.)
Nominal Clad Thickness	0.057 cm (0.023 in.)	0.057 cm (0.023 in.)	0.064 cm (0.025 in.)
Clad Material	Zirconium alloy	Zirconium alloy	Zirconium alloy
Nominal Assembly Envelope	21.39 cm (8.42 in.)	21.39 cm (8.42 in.)	22.94 cm (9.03 in.)
Nominal Lattice Pitch	1.260 cm (0.496 in.)	1.260 cm (0.496 in.)	1.270 cm (0.500 in.)

5.(b)(1) Fuel Assembly (Continued)

(ii) Non-fissile base-plate mounted core components and spider-body core components are permitted.

(iii) Neutron sources or other radioactive material are not permitted.

(iv) Materials with moderating effectiveness greater than full density water are not permitted.

(v) There is no restriction on the length of top and bottom annular blankets.

(2) Loose Fuel Rods

Unirradiated uranium dioxide fuel rods with a maximum uranium-235 enrichment of 5.0 weight percent. Fuel rods shall be transported in the Traveller package inside either a rod pipe or rod box as specified in License Drawings 10006E58 or 10006E59, specified in Section 5(a)(3). The fuel rods shall meet the parametric requirements given below:

Parameter	Limit
Maximum Enrichment	5.0 weight percent uranium-235
Pellet diameter	0.508 – 1.524 cm (0.20 – 0.60 in.)
Maximum stack length	Up to rod container length
Cladding	Zirconium alloy
Integral absorber	Gadolinia, erbia, and boron
Wrapping or sleeving	Plastic or other material with moderating effectiveness no greater than full density water
Maximum number of rods per container	Up to rod container capacity

5.(c) Criticality Safety Index

(1) When transporting fuel assemblies: 0.7

(2) When transporting loose rods in a rod container: 0.0

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6. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package must be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7 of the Traveller License Application, Revision 4.

   (b) Each packaging must be acceptance tested and maintained in accordance with the Acceptance Tests and Maintenance Program in Chapter 8 of the Traveller License Application, Revision 4.

7. The package authorized by this certificate is hereby authorized for use under the general license provisions of 10 CFR §71.17.

8. The package is not authorized by this certificate for air transport.

9. Revision No. 1 of this certificate may be used until December 31, 2007.

10. Expiration date: March 15, 2010.

REFERENCES

Westinghouse Electric Company application dated April 1, 2004.

Supplements dated: October 15 and November 16, 2004, and February 16, March 4, and March 10, 2005, and March 17 and April 12, 2006, September 26 and December 12, 2006.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Christopher M. Regan, Acting Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Date: December 21 2006

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION REPORT

Docket No. 71-9297
Model Nos. Traveller STD and Traveller XL
Certificate of Compliance No. 9297
Revision No. 2

SUMMARY

By letter dated September 26, 2006, and supplemented by letter dated December 12, 2006, Westinghouse Electric Company, LLC (Westinghouse or the applicant) submitted a request for amendment to Certificate of Compliance (CoC) No. 9297, for the Model Nos. Traveller STD and Traveller XL. The request was for approval of packaging components to secure non-Westinghouse type fuel assemblies in the Model Nos. Traveller STD and Traveller XL.

Based on the statements and representations in the application, the staff finds that the changes do not affect the ability of the packages to meet the requirements of 10 CFR Part 71.

EVALUATION

By letter dated September 26, 2006, and supplemented by letter dated December 12, 2006, Westinghouse submitted a request for amendment to CoC No. 9297, for the Model Nos. Traveller STD and Traveller XL. The request included information about packaging components Westinghouse plans to use to secure the non-Westinghouse type fuel assemblies in Model Nos. Traveller STD and Traveller XL, and a revision to the safety analysis report (SAR) for the CoC to describe the new packaging components. The authorized contents for the Model Nos. Traveller STD and Traveller XL already include non-Westinghouse type fuel assemblies.

Enclosure 1 of the applicant's letter dated September 26, 2006, provided a description of the proposed changes, justification for the proposed changes, and an analysis examining the differences in the overall forces and the mechanical response of structural components, when subjected to the hypothetical accident condition (HAC) in a Traveller package for the non-Westinghouse type fuel assemblies (namely CE and ATOM), rather than the Westinghouse 17 x 17-XL fuel assembly, which was used in the Traveller Certification Test Unit (CTU) drop test.

The Model Nos. Traveller STD and Traveller XL consists of two principal structural components, the "outerpack" and the "clamshell." The Traveller packagings are designed to transport a single fuel assembly or a single "rod container" (which is used when transporting loose fuel rods rather than a fuel assembly). However, the non-Westinghouse type fuel assemblies require a

bottom spacer under the fuel assembly, and a modified axial restraint at the top end to prevent the axial movement of the fuel during normal transport.

The three CE fuel assembly type designs authorized to be transported in Model Nos. Traveller STD and Traveller XL packagings are all shorter than the Westinghouse fuel assembly type. Thus, the need for a bottom end spacer. The bottom spacer assembly is comprised of six major pieces: top and bottom neoprene rubber pads, two stainless steel base plates, a stainless steel support pipe, and a stainless steel rod handle. The total weight for the bottom spacer assembly is 34.5 pounds (lbs.).

For the CE fuel a variant axial restraint system at the top of the fuel assembly is used. This variant axial restraint system is mainly comprised of: a stainless steel axial clamp arm, a stainless steel clamp arm extension, a stainless steel threaded rod, an aluminum axial base plate, and a neoprene rubber bottom pad. The total weight for the top restraint system is 7.5 lbs. The total weight of heaviest CE fuel assembly, plus the Traveller packaging is 4,611 lbs.

The 16 x 16 and 18 x 18 ATOM fuel assembly design types are also authorized to be transported in Model Nos. Traveller STD and Traveller XL packagings. These fuel assemblies will not require the bottom spacer assembly, but will require the same top restraint system as CE fuel assembly. The total weight of the heaviest ATOM fuel assembly, plus the Traveller packaging is 5,051 lbs.

Based on the previous analyses and testing it was determined that the most severe impact for the fuel assembly contents and packaging was the 9-meter impact in a bottom-end down orientation. The damage to the outerpack is a function of the total weight of the package. Since the total weight for both the CE fuel assembly type designs and the ATOM fuel assembly type designs are less than the total weight of design and licensing basis gross weight of 5,100 lbs., the resulting applied loads to the outerpack from a 9-meter drop would be less than the applied loads from the CTU drop, and therefore damage would be expected to be less.

The damage to the clamshell was also considered in the applicant's analysis. The CTU drop test kinetic energy and resultant forces were normalized to reflect responses to a 9-meter drop test to simplify the comparison with non-Westinghouse fuel assembly type configurations. The total forces on the clamshell were determined using an energy method. As discussed above, the total loads imposed on the clamshell would be less than those experienced in the CTU tests, as the CE and ATOM fuel assembly type designs are lighter than the CTU fuel assembly.

For a bottom nozzle end drop, the bottom spacer for the CE fuel assembly type design (6 inch schedule 40 pipe, 13.25 inches long) was evaluated using the heaviest CE fuel assembly design to bound all the fuel types by weight. The applicant calculated the maximum load before the pipe would buckle to be 195,000 lbs. The staff performed an independent check and found that the actual load at which the pipe could buckle was 183,000 lbs. However, this difference was determined to be immaterial.

Regardless of the buckling load, the staff agrees with the applicant's understanding that although some buckling of the fuel spacer assembly may occur, the load will be transferred from the impact pillow in the outerpack through the clamshell bottom head to the fuel assembly. The fuel assembly would not be in free-fall and would not impact the clamshell bottom head

with a significant differential velocity. Therefore, the fuel assembly would not shift under the HAC with the alternative restrain system.

For the top nozzle end drop condition, the applicant presented the summary of an analysis and results in Enclosure 1, Table 1. This summary demonstrated that for the CE top restraint system the maximum load before buckling would occur, P = 11,500 lbs., is substantially higher than the actual load calculated for the top restraint system used in the CTU tests, P = 6,200 lbs. The applicant has also presented an analysis using conservative assumptions which demonstrated that for the ATOM fuel assembly type design the maximum force exerted on the clamshell and contents would be approximately 561,000 lbs. (which is less than the force calculated for the CTU tests of 566,000 lbs.). The staff has reviewed this analysis and concurs with the results.

The staff finds that the proposed changes as shown in Enclosures 2 and 3 of the applicant's letter dated September 26, 2006, including the changes to the SAR, Revision 6, and changes to Westinghouse Drawing 10004E58, Sheets 1 and 7 are acceptable, as these changes do not affect the ability of the Model Nos. Traveller STD and Traveller XL to meet the requirements of 10 CFR Part 71.

CONCLUSION

Certificate of Compliance No. 9297 has been amended as follows:

> Condition No. 5(a)(3) of the certificate has been revised to reflect revision to Drawing 10004E58.

Based on the statements and representations in the application the staff finds that these changes do not affect the ability of the Model Nos. Traveller STD and Traveller XL to meet the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9297,
Revision No. 2, on December 27, 2006.